

Table 1. Monthly Climatic Averages for Snoqualmie Pass, Washington WSO**Rainy Mine EE/CA**

Parameter	Month												Annual
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Average Maximum Temperature (°F)	31.9	37	42.4	49.3	57.2	62.9	70.4	69.6	64.6	53.9	39.3	33.4	51
Average Minimum Temperature (°F)	21.1	23.6	26.1	30.4	34.5	40.4	46	46.2	41.7	35.6	28.2	24.1	33.2
Average Total Precipitation (in)	15.91	12.39	11.18	6.39	4.25	3.97	1.58	2.2	4.75	9.73	14.94	17.46	104.76
Average Total Snowfall (in)	106.9	81.1	78	27.2	5.1	0.1	0.1	0.0	0.2	6.7	43.5	91.5	440.4
Average Snow Depth (in)	70	91	96	76	32	2	0	0	0	0	10	37	34

Notes:

Source: National Weather Service, Period of Record 2/19/70 to 4/30/07 (WRCC 2007)

Percent of possible observations for period of record: maximum temperature = 96%, minimum temperature = 95.9%, precipitation = 95.6%, snowfall = 97.2%, snow depth = 96.8%

°F = Degrees Fahrenheit

in = inches

Table 3. Background Soil Analytical Results Summary
Rainy Mine EE/CA

Sample ID	Date Collected	pH	Analyte Concentration (mg/kg)																												
			Ca	K	Mg	Na	Ag	Al	As ₃	As ₅ ^b	As _T	Ba	Be	Cd	Co	As ₅ ^b	Cr ₆	Cr _T	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn		
RM-BGS-1	6/27/2004	4.4	670	250	930	150	0.71	21900	0.534	58.3	58.8	21.3	0.3	0.15	2	4.0	0.52	5	38.6	13000	0.08	52.9	2.2	5.37	0.1	0.6	0.07	24.1	13		
RM-BGS-2	6/27/2004	5.1	1490	550	1620	160	0.43	23800	0.465	26.5	27	47.9	0.2	0.25	4	5.9	0.53	7	547	19500	0.08	196	7.1	82	0.8	0.5	0.1	29.5	166		
RM-BGS-3	6/27/2004	4.9	670	240	730	210	0.13	14300	0.235	7.5	7.7	14.10.1	0.14	3	NC	27.1	4	15	12600	0.11	161	1.9	6.71	0.2	0.25	0.08	25.5	12			
minimum =		4.4	670	240	730	150	0.13	14300	0.24	7.5	7.7	14.1	0.1	0.14	2	4.0	0.52	4	15	12600	0.08	52.9	1.9	5.4	0.1	0.25	0.07	24.1	12		
MDC =		5.1	1490	550	1620	210	0.71	23800	0.53	58.3	58.8	47.9	0.3	0.25	4	5.9	27.1	7	547	19500	0.11	196	7.1	82	0.8	0.60	0.10	29.5	166		
average =		4.8	943	347	1093	173	0.65	20000	0.41	30.8	31.2	27.8	0.2	0.18	3	5.0	9.4	5.3	200	15033	0.09	137	3.7	31.4	0.4	0.45	0.08	26.4	64		
# of samples = 3, Standard deviation =0.3			387	144	381	26	0.24	4104	0.13	21.0	21.1	14.5	0.1	0.05	1	1.0	12.5	1.2	245	3163	0.01	61	2.4	35.8	0.3	0.15	0.01	2.3	72		
Frequency detected =			100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	67%	100%	100%	100%	100%	33%	100%	100%	100%	100%	100%	100%	100%	100%	67%	100%	100%		
Human Health Screening Criteria:																															
WDOE MTCA Method A Industrial Soil Cleanup Levels – Human Receptors (WDOE 2001a)							NS	NS	NS	NS	20	NS	NS	2	NS	2000	19	19	NS	NS	2	NS	NS	1000	NS	NS	NS	NS	NS		
EPA Region IX Industrial Soil PRGs (EPA 2004)							5100	100000	NS	NS	1.6	67000	1900	450	1900	100000	30	450	41000	100000	310	19000	20000	800	410	5100	67	1000	100000		
Ecological Screening Criteria:																															
WDOE MTCA Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals (WDOE 2001b)								2	50	7	10	NS	102	10	4	20	NS	NS	42	50	NS	0.1	1100	30	50	5	0.3	1	2	36	
EPA Ecological Soil Screening Levels (Eco-SSLs) (EPA 2005)								NS	NS	NS	NS	18	330	21	0.36	13	26	81	NS	NS	NS	NS	NS	NS	NS	11	0.27	NS	NS	7.8	NS

Notes:

Italics - result below method detection limit, reported at 1/2 reporting limit

Underline- result between method detection limit and practical quantitation limit, reported at detected concentration

Bold values are the maximum detected concentrations (MDC)

Screening criteria exceeded

^a95 Percent upper confidence levels not computed because fewer than four samples.

^bCalculated value.

EPA = U.S. Environmental Protection Agency

MTCA = Model Toxics Control Act

NC = Not computed

NS = No standard

PRG = Preliminary remediation goal

WDOE = Washington Department of Ecology

mg/kg = Milligram per kilogram

Table 4. Surface Water Analytical Results Summary
Rainy Mine EE/CA

Sample ID	Date Collected	Analyte Concentration (µg/L) ^a																						
		Ag	Al	As ₃	As ₅ ^e	As _T	Ba	Be	Cd	Co	Cr ₃ ^e	Cr ₆	Cr _T	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn
QC-SW1 - background	6/27/2004	0.025	80	0.192	0.908	1.1	1.5	1	0.05	5	5	0.50	5	0.25	5	0.00089	2.5	5	0.05	0.1	1	0.025	2.5	5
RM-BG-SW4 - background	6/28/2004	0.025	90	0.043	0.018	0.25	1.5	1	0.05	5	5	0.05	5	0.25	20	NA	2.5	5	0.05	0.1	1	0.025	2.5	5
minimum =	0.025	80	0.043	0.018	0.25	1.5	1	0.05	5	5	0.05	5	0.25	5	0.00089	2.5	5	0.05	0.1	1	0.025	2.5	5	
MDC =	0.025	90	0.192	0.908	1.1	1.5	1	0.05	5	5	0.5	5	0.25	20	0.00089	2.5	5	0.05	0.1	1	0.025	2.5	5	
average =	0.025	85	0.1175	0.463	0.675	1.5	1	0.05	5	5	0.275	5	0.25	12.5	0.00089	2.5	5	0.05	0.1	1	0.025	2.5	5	
SW-1 (collected by MSE ^c)	6/12/2007					1.5																		
Taylor River ^d :																								
TR-SW1	6/26/2004	0.025	50	0.069	0.216	0.25	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00046	2.5	5	0.05	0.1	1	0.025	2.5	5
TR-SW2	6/26/2004	0.025	50	0.115	0.193	0.25	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00053	2.5	5	0.05	0.1	1	0.025	2.5	5
Site:																								
QC-SW2	6/27/2004	0.025	70	0.131	1.269	1.4	1.5	1	0.05	5	5	0.5	5	0.25	20	0.00091	2.5	5	0.05	0.1	1	0.025	2.5	5
QC-SW3	6/27/2004	0.025	100	0.117	1.283	1.4	1.5	1	0.05	5	5	0.5	5	1.1	10	0.00082	2.5	5	0.05	0.1	1	0.025	2.5	5
QC-SW4	6/26/2004	0.025	70	0.163	0.937	1.1	1.5	1	0.05	5	5	0.5	5	0.8	5	0.00089	2.5	5	0.05	0.1	1	0.025	2.5	5
RM-SEEP-SW1	6/28/2004	0.025	1260	0.044	14.1	14.1	8	1	0.2	5	5	0.5	5	687	580	0.00065	34	5	0.05	0.1	1	0.025	2.5	20
RM-SEEP-SW2	6/28/2004	0.16	2890	0.0035	1.893	1.9	14	1	0.7	5	5	0.5	5	2020	150	0.00079	54	5	0.5	0.1	1	0.025	2.5	60
RM-AWR-SW3	6/28/2004	0.025	110	5.43	52.3	57.7	4	1	0.05	5	5	0.5	5	2.1	30	0.00033	2.5	5	0.05	0.1	1	0.025	2.5	5
minimum (excluding BG) =	0.025	70	0.0035	0.937	1.1	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00033	2.5	5	0.05	0.1	1	0.025	2.5	5	
MDC (excluding BG) =	0.16	2890	5.43	52.3	57.7	14	1	0.7	5	5	0.5	5	2020	580	0.00091	54	5	0.5	0.1	1	0.025	2.5	60	
average (excluding BG) =	0.05	750	0.98	12.0	12.9	5.1	1	0.2	5	5	0.5	5	452	133	0.00073	16.3	5	0.13	0.1	1	0.025	2.5	16.7	
95% UCL =	0.03	5416	15.8	68.4	71.9	9.2	1	1.2	5	5	0.5	5	10076	1330	0.00091	107	5	0.45	0.1	1	0.025	2.5	106	
# of samples = 10, Standard deviation =	0.04	1049	2.0	18.6	20.5	4.6	0	0.2	0	0	0	0	0	745	206	0.00020	20	0	0.17	0	0	0	0	20
Frequency detected =	10%	100%	90%	80%	70%	70%	0%	20%	0%	0%	0%	0%	0%	50%	60%	100%	20%	0%	10%	0%	0%	0%	20%	
Human Health Screening Criteria:																								
1a - Washington HH		NS	NS	NS	NS	0.018	NS	NS	NS	NS	NS	NS	NS	NS	NS	0.14	NS	610	NS	14	170	1.7	NS	NS
1b - Washington HH		100	NS	NS	NS	10	2000	4	5	NS	NS	NS	100	1300	300	2	50	100	15	6	50	2	NS	5000
2- EPA HH		NS	NS	NS	NS	0.018	1000	NS	NS	NS	NS	NS	NS	1300	300	NS	50	610	NS	5.6	170	0.24	NS	7400
Ecological Screening Criteria:																								
3- Washington Ecob		NS	NS	NS	NS	190	NS	NS	0.08	NS	10.1	10.0	NS	0.57	NS	0.012	NS	8.1	0.05	NS	5	NS	NS	54
4- EPA Ecob		0.36	NS	NS	3.1	150d	4	0.66	0.02	23	4	11d	NS	0.45	1000	0.77d	120	3	0.05	30	5	12	20	61
Sample ID	Flow (gpm)	pH	Analyte Concentration (µg/L) ^a						Notes: Italics - result below method detection limit, reported at 1/2 reporting limit Underline- result between method detection limit and practical quantitation limit, reported at detected concentration Bold values are the maximum detected concentrations (MDC) Screening criteria exceeded ^a Total concentrations ^b Screening criteria for hardness dependent metals are based on an apparent background hardness of 3 and were converted to total where applicable. ^c Sample collected during site reconnaissance by MSE from unnamed drainage upstream of waste rock pile WR-2; only analyzed for ^d Samples from Taylor River were not included with samples from the site in determining minimum, maximum, and average concentrations ^e Calculated value. BG = Background d = Dissolved EPA = U.S. Environmental Protection Agency NOAA = National Oceanic and Atmospheric Administration NM = No measurement NS = No standard UCL = Upper confidence limit WDOE = Washington Department of Ecology WSDH = Washington State Department of Health µg/L = Microgram per liter gpm = gallon per minute															
			Ca	Hard	K	Mg	Na	Sulfate																
QC-SW1 - background	NM	6.3	1200	_ 3	<u>300</u>	100	<u>900</u>	<u>20</u>																
RM-BG-SW4 - background	NM	6.1	1300	NA	150	100	150	NA																
minimum =	6.1	1200	_ 3	150	100	150	<u>20</u>																	
MDC =	6.3	1300	_ 3	<u>300</u>	100	<u>900</u>	<u>20</u>																	
average =	6.2	1250	_ 3	225	100	525	<u>20</u>																	
Taylor River:																								
TR-SW1	NM	6.5	1200	_ 3	150	100	<u>600</u>	5																
TR-SW2	NM	6.5	1200	_ 3	150	100	<u>700</u>	<u>10</u>																
Site:																								
QC-SW2	14.1	6.6	1200	_ 3	150	100	<u>900</u>	<u>10</u>																
QC-SW3	16.4	6.5	1200	_ 3	150	100	<u>1000</u>	5																
QC-SW4	NM	6.5	1000	_ 3	150	100	<u>900</u>	5																
RM-SEEP-SW1	0.0007	6.7	7800	21	<u>500</u>	400	3200	20																
RM-SEEP-SW2	0.0005	4.3	6700	19	<u>600</u>	600	3500	50																
RM-AWR-SW3	0.002	7.1	7600	20	<u>500</u>	300	3200	<u>20</u>																
minimum (excluding BG) =	4.3	1000	_ 3	150	100	<u>900</u>	5																	
MDC (excluding BG) =	7.1	7800	21	<u>600</u>	600	3500	50																	
average (excluding BG) =	6.3	4250	11.5	342	267	<u>2117</u>	18.3																	
95% UCL =		10840		721	437	4042	32.3																	

Table 5. Sediment Analytical Results Summary
Rainy Mine EE/CA

Sample ID	Date Collected	TOC (%)	Analyte Concentration (mg/kg)																											
			Ca	K	Mg	Na	CN	Ag	Al	As ₃	As ₅ ^a	As _T	Ba	Be	Cd	Co	Cr ₃ ^a	Cr ₆	Cr _T	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn
QC-SS-1 - Background	6/27/2004	0.5	960	1670	2770	130	0.3	0.04	6950	0.161	9.3	9.5	66.8	0.1	0.39	4	5	0.955	6	18	10600	0.02	181	2.7	4.78	0.1	0.25	0.11	23.9	31
Taylor River:																														
TR-SS-1	6/26/2004	0.2	1690	1750	3270	190	NA	0.13	6490	0.086	3.5	3.6	53.1	0.1	0.14	4	2.2	0.786	3	19	12100	0.02	216	3.8	7.4	0.05	0.25	0.13	22.6	40
TR-SS-2	6/28/2004	0.2	1920	1510	2990	280	NA	0.08	6790	0.068	5.3	5.4	44.1	0.1	0.12	3	3.2	0.823	4	16	10500	0.02	189	3.1	3.48	0.05	0.25	0.11	20.3	30
Site:																														
QC-SS-2	6/27/2004	2.2	1490	1300	2540	230	NA	0.06	7550	0.098	12.2	12.3	61.6	0.1	0.22	4	3.1	0.936	4	27	9540	0.02	184	2.3	4.97	0.05	0.25	0.09	20.5	31
QC-SS-3	6/27/2004	0.6	1180	1090	2390	190	0.25	0.28	6950	0.101	22.5	22.6	48.1	0.1	0.17	3	5.2	0.764	6	145	9700	0.02	135	2.4	3.6	0.05	0.25	0.07	17.7	30
QC-SS-4	6/26/2004	0.2	1590	1350	2110	250	0.25	0.09	5750	0.137	15.2	15.3	36.8	0.1	0.14	3	2.2	0.765	3	30	8150	0.02	152	1.6	3.12	0.2	0.25	0.09	17	23
RM-SEEP-SS-1	6/28/2004	8.8	3210	1420	3150	220	2	4.79	44200	1.025	178	179	66.3	0.6	1.27	8	8.4	2.573	11	4410	23300	0.025	167	7	27.2	0.5	0.8	0.23	39.9	82
RM-SEEP-SS-2	6/28/2004	6.8	2360	1330	5100	320	0.5	33.9	19500	3.342	201.7	205	63.1	0.1	0.69	4	9.9	1.119	11	2620	49700	0.19	198	7	31.2	1.0	7	0.18	50.2	90
minimum (excluding BG) =	0.2		1180	1090	2110	190	0.25	0.06	5750	0.098	12.2	12.3	36.8	0.1	0.14	3	2.2	0.76	3	27	8150	0.02	135	1.6	3.12	0.05	0.25	0.07	17.0	23
MDC (excluding BG) =	8.8		3210	1420	5100	320	2.0	33.9	44200	3.34	201.7	205	66.3	0.6	1.27	8	9.9	2.57	11	4410	49700	0.19	198	7	31.2	1.0	7.0	0.23	50.2	90
average (excluding BG) =	3.7		1966	1298	3058	242	0.8	7.8	16790	0.94	85.9	86.8	55.2	0.2	0.50	4	5.8	1.23	7	1446	20078	0.06	167	4.1	14.0	0.36	1.7	0.13	29.1	51
95% UCL =			2748	1417	4205	288	4.1	207	32330	5.60	393	398	67.0	0.6	0.96	7	8.9	2.3	11	3346	36924	0.20	191	6.6	27.3	0.74	10.3	0.20	43.5	8
# of samples = 9, Standard deviation =			667	199	860	55	0.7	11	12510	1.07	78	79	10	0.2	0.38	2	2.7	0.6	3	1569	13242	0.06	24	2.0	10.8	0.32	2.2	0.05	11.2	24
Frequenecy detected =			100%	100%	100%	1%	0%	100%	100%	100%	100%	100%	100%	11%	100%	100%	100%	100%	100%	100%	100%	100%	11%	100%	100%	100%	33%	22%	100%	100%
Human Health Screening Criteria:																														
WDOE MTCA Method A Industrial Soil Cleanup Levels – Human Receptors (WDOE 2001a)								NS	NS	NS	NS	20	NS	NS	2	NS	2000	19	19	NS	NS	2	NS	NS	1000	NS	NS	NS	NS	
EPA Region IX Industrial Soil PRGs (EPA 2004)								5100	100000	NS	NS	1.6	67000	1900	450	1900	100000	30	450	41000	100000	310	19000	20000	800	410	5100	67	1000	
Ecological Screening Criteria:																														
State of Washington Development of Freshwater Sediment Quality Values (WDOE 2004) - recommended only								2.0	NS	NS	NS	20.0	NS	NS	0.6	NS	NS	NS	95.0	80.0	NS	0.5	NS	60.0	335	0.4	NS	NS	NS	
State of Washington Development of Freshwater Sediment Quality Values (WDOE 2004) - in development								3.9	NS	NS	NS	5.9	NS	NS	0.6	NS	NS	NS	26.0	16.0	NS	0.17	NS	16.0	31.0	35.0	NS	NS	NS	NS
EPA Threshold Effects Level (NOAA 1999)								NS	NS	NS	NS	5.9	NS	NS	0.596	NS	NS	NS	37.3	35.7	NS	0.174	NS	18	35	NS	NS	NS	NS	
EPA Freshwater Probable Effects Level (NOAA 1999)								NS	NS	NS	NS	17	NS	NS	3.53	NS	NS	NS	90	197	NS	0.486	NS	35.9	91.3	NS	NS	NS	NS	

Notes:

Italics - result below method detection limit, reported at 1/2 reporting limit

Underline- result between method detection limit and practical quantitation limit, reported at detected concentration

Bold values are the maximum detected concentrations (MDC)

Screening criteria exceeded

^aCalculated value.

BG = Background

EPA = U.S. Environmental Protection Agency

MTCA = Model Toxics Control Act

NOAA = National Oceanic and Atmospheric Administration

NS = No standard

ORNL = Oak Ridge National Laboratory

UCL = Upper confidence limit

WDOE = Washington Department of Ecology

mg/kg = Milligram per kilogram

Table 6. Pore Water Analytical Results Summary
Rainy Mine EE/CA

Sample ID	Date Collected	Analyte Concentration (µg/L) ^a																									
		Ag	Al	As ₃	As ₅ ^c	As _T	Ba	Be	Cd	Co	Cr ₃ ^c	Cr ₆	Cr _T	Cu	Fe	Hg	Mn	Ni	Pb	Sb	Se	Tl	V	Zn			
QC-PW-1 - background	6/27/2004	0.025	50	0.186	0.91	1.1	1.5	1	0.05	5	5	0.5	5	0.25	5	0.0008	2.5	5	0.05	0.1	0.05	0.2	2.5	5			
QC-PW2	6/27/2004	0.025	50	0.083	1.22	1.3	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00088	2.5	5	0.05	0.1	0.05	0.18	2.5	5			
QC-PW3	6/27/2004	0.025	40	0.051	1.35	1.4	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00177	2.5	5	0.05	0.1	0.05	0.08	2.5	5			
QC-PW4	6/26/2004	0.025	60	0.028	0.97	1	4	1	0.05	5	5	0.5	5	1.9	5	0.00286	2.5	5	0.05	0.1	0.05	0.05	2.5	5			
RM-seep-PW1	6/28/2004	0.025	1320	8.08	0.02	8.1	17	1	0.5	5	5	0.5	5	409	9360	0.0011	60	5	0.2	0.1	0.05	6.0	2.5	70			
RM-seep-PW2	6/28/2004	0.025	40	3.68	28.42	32.1	1.5	1	0.2	5	5	0.5	5	0.6	5	0.00013	2.5	5	0.05	0.1	0.05	0.05	2.5	5			
minimum (excluding BG) =		0.025	40	0.028	0.02	1	1.5	1	0.05	5	5	0.5	5	0.25	5	0.00013	3	5	0.1	0.1	0.1	0.05	2.5	5			
MDC (excluding BG) =		0.025	1320	8.08	28.42	32.1	17	1	0.5	5	5	0.5	5	409	9360	0.0029	60	5	0.2	0.1	0.05	6.0	2.5	70			
average (excluding BG) =		0.03	302	2.38	6.4	8.8	5.1	1	0.2	5	5	0.5	5	82	1876	0.0013	14.0	5	0.08	0.1	0	1.27	2.5	18			
95% UCL =		0.025	2835	5.77	1539	49.7	20	1	0.47	5	5	0.5	5	438	10031	0.0023	128	5	0.21	0.1	0.05	6.42	2.5	147			
# of samples = 6, Standard deviation =		0	474	3.01	10	11.3	6	0	0.17	0	0	0	0	152	3486	0.0009	21	0	0.06	0	0	2.20	0	24			
Frequency detected =		0%	100%	100%	100%	100%	33%	0%	33%	0%	0%	0%	0%	50%	17%	100%	17%	0%	17%	0%	0%	83%	0%				
Ecological Screening Criteria																											
1- Washington Ecob		NS	NS	NS	NS	190	NS	NS	0.08	NS	10.1	10.0	NS	0.57	NS	0.012	NS	8.1	0.05	NS	5	NS	NS				
2- EPA Ecob		0.36	NS	NS	3.1	150d	4	0.66	0.02	23	4.2	11d	NS	0.45	1000	0.77d	120	2.7	0.05	30	5	12	20				
		Analyte Concentration (µg/L) ^a							<div>Notes:</div> <div>Italics - result below method detection limit, reported at 1/2 reporting limit</div> <div>Underline- result between method detection limit and practical quantitation limit, reported at detected concentration</div> <div>Bold values are the maximum detected concentrations (MDC)</div> <div><div>Screening criteria exceeded</div></div> <div>^aDissolved concentrations</div> <div>^bScreening criteria for hardness dependent metals are based on a average hardness of 6.2.</div> <div>^cCalculated value.</div> <div>BG = Background</div> <div>EPA = U.S. Environmental Protection Agency</div> <div>NOAA = National Oceanic and Atmospheric Administration</div> <div>NS = No standard</div> <div>UCL = Upper confidence limit</div> <div>WDOE = Washington Department of Ecology</div> <div>µg/L = Microgram per liter</div>																		
Sample ID	pH	Ca	Hard	K	Mg	Na	Sulfate	CN																			
RM-BG-SW4 - background	6.5	1200	3	150	100	1000	5	0.005																			
QC-PW2	6.1	1200	3	150	100	1000	20	NA																			
QC-PW3	6.4	1200	3	150	100	1000	20	0.005																			
QC-PW4	6.2	1000	3	150	100	1000	10	0.005																			
RM-seep-PW1	5.6	6400	19	600	600	2600	40	NA																			
RM-seep-PW2	4.6	1200	3	150	100	1000	40	NA																			
minimum (excluding BG) =		4.6	1000	3	150	100	1000	10																			0.005
MDC (excluding BG) =		6.4	6400	19	600	600	2600	40																			0.005
average (excluding BG) =		5.8	2200	6.2	240	200	1320	26	0.005																		
95% UCL =			6780		632	636	2002	39																			
1-State of Washington ambient water quality criteria for protection of aquatic life, chronic criterion (WDOE 2003)																											
2-EPA recommended chronic ambient water quality criteria for freshwater aquatic life (EPA 2006); if none existed, use WDOE																											
II secondary chronic values (NOAA 1999)																											

17%

5.4

6.1

**Table 7. Summary of Waste Volumes and Selected Metal Concentrations
Rainy Mine EE/CA**

			Selected Metal Concentration (mg/kg)		
Area	Location	Estimated Volume (bcy)	Arsenic	Copper	Silver
Average background soil =			0.41	200	0.65
Average background sediment =			9.5	18	0.04 ^a
WR-1	Mill Site (east zone)	2000	222	1970	41.3
WR-2	West zone	25	15800	1310	15.0
S1 and S3	Soil around mill foundation	20	298	1660	41.1
RM-SEEP-SS-1	Sediment at west toe of waste rock pile WR-1	10	179	4410	4.8
RM-SEEP-SS-2	Sediment at east toe of waste rock pile WR-1	10	205	2620	33.9

Notes:

Data in this table represent analytical results of samples collected during the Site Inspection (CES 2005).

^a Analytical result between the method detection limit (MDL) and practical quantitation limit (PQL); value = detected concentration

bcy = Bank cubic yard

mg/kg = Milligram per kilogram

Table 8. Surface Water Quality ARARs and Proposed Cleanup Criteria (total recoverable µg/L)
Rainy Mine EE/CA

Analyte	Apparent Background Concentration ^a	Maximum Detected Concentration	State of Washington		Federal				Proposed Surface Water Cleanup Criteria
			WAC 173-201A	WAC 246-290	Clean Water Act Section 304		National Toxics Rule 40 CFR 131.26		
			Protection of Aquatic Life, Chronic ^{b,c}	Drinking Water Criteria	Human Health Consumption of Water+Organism	Freshwater Chronic ^b	Human Health Consumption of Water+Organism	Freshwater Chronic ^b	
Aluminum	85	2890							87
Arsenic	0.68	57.7	190	10	0.018	150	0.018	190	10
Barium	1.5	14		2000	1000				4
Cadmium	0.05	0.7	0.08	5		0.02		0.08	0.08
Copper	0.25	2020	0.57	1300	1300	0.45 ^d		0.57	0.57
Iron	12.5	580		300	300	1000			300
Manganese	2.5	54		50					50
Lead	0.05	0.5	0.05	15		0.05		0.05	0.05
Zinc	5	60	5.4	50000	7400	6.1		5	5.4

Notes:

Italics - result below method detection limit, reported at 1/2 reporting limit

Underline - result between method detection limit and practical quantitation limit, reported at detected concentration

µg/L = Microgram per liter

^aBased on one background sample from Quartz Creek upstream of the site and one sample from unnamed drainage.

^bHardness dependent criteria adjusted based on an apparent background hardness of 3; also converted to total concentrations where applicable.

^cFor protection of human health, State of Washington defaults to National Toxics Rule 40 CFR 131.26.

^dThe federal Aquatic Life Ambient Freshwater Quality Copper Criterion was revised in 2007 and is to be calculated using site-specific water quality parameters (EPA 2007); however, there is insufficient site data available to calculate the criterion. Therefore, the 2006 criterion was used.

ARAR = Applicable or relevant and appropriate requirement

CFR = Code of Federal Regulations

PRG = Preliminary Remediation Goal

WAC = Washington Administrative Code

Table 9. Soil Quality ARARs and Proposed Cleanup Criteria (mg/kg)

Rainy Mine EE/CA

Analyte	Apparent Background Concentration ^a	Maximum Detected Concentration	State of Washington			Federal	Human Health Risk-based Criteria ^c	Proposed Soil Cleanup Criteria
			WAC 173-340-740	WAC 173-340-7492	WAC 170-340-7493	EPA		
			MTCA Method A Industrial Soil (Table 745-1)	Method B Unrestricted Land Use (Table 749-2)	Method B Ecological Receptor ^b (Table 749-3)	Region 9 PRGs - Industrial Soil		
Aluminum	20000	26200	NS	NS	50p	100000		20000
Antimony	0.37	5.3	NS	NS	5p	410		5
Arsenic	31.2	15800	20 (As ³)	20 (As ³)	10p (As ⁵)	1.6	33	33
Cadmium	0.18	0.61	2	25	4p	450		2
Chromium	5.3	<u>12</u>	19 (Cr ⁶)	42	42p,s	450		19
Copper	200	1970	NS	100	50s	41000		200
Mercury	<u>0.09</u>	1.08	2	9	0.1s	310		0.1
Lead	31.4	79.6	1000	220	50p	800		50
Selenium	0.45	11.1	NS	0.8	0.3w	5100		0.45
Silver	0.65	41.3	NS	NS	2p	5100		2
Thallium	<u>0.08</u>	<i>1.5</i>	NS	NS	1p	67		1
Vanadium	26.4	67	NS	26	2p	1000		26.4
Zinc	63.7	69	NS	270	86p	100000		86

Notes:

Italics - result below method detection limit, reported at 1/2 reporting limit

Underline - result between method detection limit and practical quantitation limit, reported at detected concentration

mg/kg = Milligram per kilogram

^aBased on three background soil samples.

^bLowest value selected from plant(p), soil biota(s), and wildlife(w) receptors

^cFrom Rainy Mine Streamlined Human Health and Ecological Risk Assessment (MSE 2006). Value calculated using human health risk equations, site-specific exposure factors, and an allowable non-carcinogenic hazard index of 1 and a carcinogenic risk of 1.E-05.

ARAR = Applicable or relevant and appropriate requirement

EPA = U.S. Environmental Protection Agency

MTCA = Model Toxics Control Act

NS = No standard

PRG = Preliminary Remediation Goal

WAC = Washington Administrative Code

Table 10. Sediment Quality ARARs and Proposed Cleanup Criteria (mg/kg)

Rainy Mine EE/CA

Analyte	Apparent Background Concentration ^a	Maximum Detected Concentration	State of Washington		Federal		Human Health Risk-based Criteria ^c	Proposed Sediment Cleanup Criteria
			WDOE 2004	WAC 173-204-320	EPA/NOAA 1999			
			Freshwater Sediment Quality Standards (Recommended Only)	Marine Sediment Management Standards ^b	Threshold Effects Level	Probable Effects Level		
Arsenic	9.5	205	20	57	5.9	17	132	132
Cadmium	0.39	1.27	0.6	5.1	0.596	3.53		0.6
Copper	18	4410	80	390	35.7	197		80
Lead	4.78	31.2	335	450	35	91.3		335
Silver	0.04	33.9	2	6.1	NS	NS		2

Notes:

Underline - result between method detection limit and practical quantitation limit, reported at detected concentration

mg/kg = Milligram per kilogram

^aBased on a single background sample collected from Quartz Creek upstream of the site.

^bFor reference only - not applicable.

^cFrom Rainy Mine Streamlined Human Health and Ecological Risk Assessment (MSE 2006). Values calculated using human health risk equations, site-specific exposure factors, and an allowable non-carcinogenic hazard index of 1 and a carcinogenic risk of 1.E-05.

ARAR = Applicable or relevant and appropriate requirement

EPA = U.S. Environmental Protection Agency

NOAA = National Oceanic and Atmospheric Administration

NS = No standard

PRG = Preliminary Remediation Goal

WAC = Washington Administrative Code

WDOE = Washington Department of Ecology

**Table 11. Summary of Areas Exceeding Risk-based Cleanup Levels
Rainy Mine EE/CA**

Media	Area	Contaminant	Risk-based Cleanup Level (mg/kg)	Maximum Detected Concentration (mg/kg)	Estimated Volume (bcy)
Soil/Waste Rock	Soil around mill foundation (S-1 & S-3)	Arsenic	33	299	25
	Waste rock pile WR-1			222	2,000
	Waste rock pile WR-2			15800	25
Sediment	Sediment at west seep	Arsenic	132	179	80
	Sediment at east seep			205	20
Total Estimated Volume of Waste Material =					2150 bcy

Notes:

bcy = Bank cubic yard

mg/kg = Milligram per kilogram

Table 12. Removal Action Technology Screening Matrix
Rainy Mine EE/CA

Technology Class	Process Option	Description	Effectiveness	Implementability	Cost	O&M	Land Impact	Pros	Cons	Retained?
No Action										
No action	No action	Leave feature(s) as is	0	0	0	none	none	Cheap, easy	No risk reduction	Yes
Institutional Controls										
Access restriction	Barbed-wire fencing	3-strand barbed-wire fence around site.	Low	High	Low	Medium—subject to vandalism	Minimal	Simple	Only a mild impediment to access	No
	Chain-link fencing	8-foot chain-link security fence around site	Medium	Low	High	Medium—subject to vandalism	Visual contrast	Simple, more effective than barbed-wire	Difficult to install on steep, uneven slopes	No
	Warning signs	Signs posted at physical hazards to warn of potential risks	Low	High	Low	Medium—subject to vandalism	Minimal	Simple, more effective than barbed-wire	Difficult to install on steep, uneven slopes	No
Physical Hazards										
Access restriction	Bat gate	Install bat gate in open adit	High	High	Low	Medium—subject to vandalism	None	Reduces ecoreceptor exposure; maintains bat habitat	Potential vandalism	Yes
	Backfill open shaft	Backfill open shaft	High	Medium	Low	Low—subject to further subsidence	Low	Eliminates physical hazard; may be able to use waste rock for fill material	Potential for future collapse; removes potential bat habitat	Yes
	Plug open adit	Install PUF or concrete plug in addition to backfill and cover	Medium	Medium	Medium	Low—inspect vandalism	Minimal	Eliminates physical hazard	Removes potential bat habitat.	No
	Cap open shaft with cupola	Install bat cupola over open shaft	High	Medium	Low	Low—inspect for sloughing around cap and vandalism	Minimal	Eliminate physical hazard; not as prone to collapse; maintains bat habitat	Not natural looking, potential vandalism	Yes
	Remove or bury debris	Remove scattered debris or bury on site	High	High	Low	None	Minimal	Cheap and easy, particularly for on-site disposal	May require waste characterization	Yes

Table 12. Removal Action Technology Screening Matrix
Rainy Mine EE/CA

Technology Class	Process Option	Description	Effective-ness	Implemen-tability	Cost	O&M	Land Impact	Pros	Cons	Retained?
Engineering Controls										
Surface controls	Runoff diversion	Use diversion channels to intercept surface water run on	Medium	High	Medium	Minimal; inspect for erosion	Low—channel	Reduce erosion and percolation of water through waste rock	Not independently effective	No
Solids containment	Soil evapo-transpiration cover	Soil cover designed to store precipitation until it evaporates	Low	Low	Medium	Low—inspect for erosion	< 1 ac repository and topsoil stockpile	Simple design/installation	More applicable to arid/semi-arid climates; would require very thick soil cover	No
	Geosynthetic cover	Engineered multilayer cover with a synthetic liner (GCL or HDPE)	High	Medium	High	Low—inspect for erosion		Eliminates infiltration through waste material	Must be installed/tested correctly	Yes
	Clay cover	Bentonite or composite clay geosynthetic cover + soil & seed	Low	Medium	Medium	High—clay subject to desiccation in semi-arid climate		Nearly eliminate infiltration; more forgiving installation than geosynthetics	Clay prone to decomposition from desiccation and freeze/thaw (ITRC 2004)	Yes
	Biological cover	Add carbohydrate– or protein–based nutrient mixes to cover soil	Medium	High	Medium	Low—inspect for erosion		Reduced leachate metals conc. (EPA 2000)	Strongly depends on mixture; design parameters not developed (EPA 2000)	No
	Cementitious cover	Fiber–reinforced concrete/mortar cover	High	Medium	High	Low—inspect for erosion		Reduce leachate metals conc.	Subject to cracking; not natural looking	No
	Polyurethane grout	Spray cover of polyurethane grout to inhibit infiltration	Medium	Medium	Medium	Low—inspect for erosion		Reduced infiltration, leachate metals conc. < MCLs (EPA 2000); more plasticity than cement grouts	Long term stability unknown (EPA 2000)	No
Land Disposal										
On-site repository	Constructed repository	Excavate waste rock and place in on–site repository	High	High	Medium	Medium—inspect cap and analyze leachate; inspect reclaimed areas	<1 ac (reclaimed)	Eliminates or reduces direct exposure	Waste remains on site; potential for re-exposure	Yes
Off-site disposal	Landfill	Excavate waste rock and dispose in landfill	High	High	High	Low—material hauled off site; inspect reclaimed areas	None	Eliminates direct exposure by removing waste from site	Risk of highway spills	Yes

Table 12. Removal Action Technology Screening Matrix
Rainy Mine EE/CA

Technology Class	Process Option	Description	Effective- ness	Implemen- tability	Cost	O&M	Land Impact	Pros	Cons	Retained?
Treatment										
Solidification/ Stabilization	Stabilization	Inject waste rock with cement or other material to physically stabilize	Medium to High	High	Medium	Low—inspect for erosion/settling	Minimal for access to waste rock piles	Does not require waste excavation	Leaves waste in the 100-year floodplain	No
Vitrification	Vitrification	Heat waste rock >2800°F to melt minerals	High	Low	High	Low—inspect for erosion/settling	Minimal for access to waste rock piles	Does not require waste excavation	Requires high energy source; high cost; leaves waste in floodplain	No
Washing	Washing	Excavate and wash waste rock with aqueous solution	Medium	Low	High	Low—inspect for erosion/settling	Minimal for access to waste rock piles and wash area	Reduces waste toxicity	Requires water source, significant waste handling; and chemical disposal	No

Table 13. Estimated Removal Action Cost Summary
Rainy Mine EE/CA

TASK	Description	Alternative 2 Cost	Alternative 3 Cost		Recommended Alternative Cost
			Alt 3A	Alt 3B	
Access Road Improvement		\$5,000	\$5,000	\$5,000	\$5,000
	subtotal =	\$5,000	\$5,000	\$5,000	\$5,000
Physical Hazards Mitigation	Bat Gate Installation	\$5,500	\$5,500	\$5,500	\$5,500
	Debris Removal	\$5,556	\$5,556	\$5,556	\$5,556
	subtotal =	\$11,056	\$11,056	\$11,056	\$11,056
Mine Waste Removal	Access Road Construction	\$107,032	\$107,032	\$107,032	\$107,032
	Mine Waste Excavation and Disposal	\$195,267	\$40,241	\$40,481	\$40,241
	French Drain Construction			\$52,803	
	Repository Construction ^(a)		\$27,169	\$126,659	\$27,169
	Mine Waste Area Reclamation	\$18,651	\$11,370	\$9,375	\$11,370
	Access Road Reclamation	\$27,075	\$33,365	\$33,365	\$33,365
	subtotal =	\$348,025	\$219,175	\$369,715	\$219,175
Miscellaneous	Staging Area Preparation	\$2,000	\$500	\$500	\$500
	Mobilization	\$20,000	\$30,000	\$30,000	\$30,000
	Temporary Erosion Control BMPs	\$5,000	\$4,000	\$5,000	\$4,000
	Install Diversion Channel Above Repository		\$1,532	\$8,370	\$1,532
	Install Temporary Fence Around Repository		\$1,768	\$2,652	\$1,768
	subtotal =	\$27,000	\$37,800	\$46,522	\$37,800
Removal Action Subtotal =		\$391,081	\$273,031	\$432,293	\$273,031
Design and Oversight	Design	\$39,108	\$40,955	\$64,844	\$40,955
	Removal Action Oversight	\$40,000	\$60,000	\$60,000	\$60,000
	subtotal =	\$79,108	\$100,955	\$124,844	\$100,955
Post-removal Monitoring	Post-removal Monitoring for 3 years	\$49,472	\$49,472	\$49,472	\$49,472
	subtotal =	\$49,472	\$49,472	\$49,472	\$49,472
SUBTOTAL =		\$519,662	\$423,458	\$606,609	\$423,458
Contingency	20% Contingency	\$103,932	\$84,692	\$121,322	\$84,692
TOTAL COST = \$ 623,594 \$ 508,150 \$ 727,931 \$ 508,150					

Notes:

^aCost based on repository cover option 1 - engineered cover; cover option 2 - earthen clay cover would increase cost from \$25,000 to \$31,000 based on options selected

Table 14. Data Gaps Summary
Rainy Mine EE/CA

Data Gap	Potential Issues	Recommended Action	Estimated Cost
Lack of sufficient background samples: -Minimal background samples collected for each media type	-Background surface water, pore water, and sediment samples may have been impacted by mining activities upstream of the Site -Prevents establishing statistically representative Background concentrations for any media at the site -May result in applying site cleanup criteria that are below background levels -Makes it difficult to evaluate removal action effectiveness or compliance with ARARs	It is generally good practice to adequately characterize background conditions at a removal action site to ensure that cleanup criteria are above background levels, to evaluate removal action effectiveness, and determine post-removal compliance with ARARs. Additional background sampling should be conducted to develop statistically valid background concentrations for all media, and the analytical MDLs should be well below applicable screening criteria.	\$3,000 - \$5,000
Concrete mill foundation not characterized: -No samples of the concrete mill foundation have been collected.	-Concrete may contain elevated leachable concentrations of metals. -May be considered a hazardous waste.	A sample from the concrete mill foundation should be collected and analyzed to determine whether the material can be disposed of in an on-site repository or sanitary landfill.	
Potential presence of T&E amphibian species: -SI indicates T&E amphibian species may be present at the site.	-T&E species are to be protected to the individual level. -May require special measures to accommodate a sensitive species.	A detailed biological survey should be conducted to determine whether T&E amphibian species are present at the site, specifically around the seeps. Should also determine whether bats inhabit the open shaft and adit. Consult with USFS biologist.	USFS
Minimal site topography: -Topography generated in the SI covers a limited portion of the mill site and surrounding area. -No detailed topography for the area between the mill site and Adit 1, or the proposed repository areas	-Difficult to prepare an engineered design for removal actions. -Difficult to delineate floodplain	Areas that will be addressed in the selected removal action alternative should be surveyed to provide adequate topography needed to prepare engineered designs and accurately estimate costs.	\$3,000-\$5,000
Total Estimated Cost =			\$6,000-\$10,000

**Table 15. Comparative Analysis of Removal Action Alternatives
Rainy Mine EE/CA**

Assessment Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal	Alternative 3 Excavation and On-site Disposal
Compliance with Removal Action Goals and Objectives			
Attributes:	Does not comply	Waste material removed from site and physical hazards mitigated.	Waste material encapsulated on site and physical hazards mitigated.
Advantages:	None	+Eliminates potential exposure at site	+Reduces exposure potential at site
Overall Protectiveness of Public Health, Safety and Welfare			
Attributes:	No protection	All waste material exceeding cleanup levels removed from site.	All waste material exceeding cleanup levels encapsulated on site.
Advantages:	None	+Higher level of human protection +Eliminates potential for future releases at the site	+High level of human protection +Eliminates risk to community from long-distance transport of waste
Environmental Protectiveness			
Attributes:	No protection	All waste material exceeding cleanup levels removed from site.	All waste material exceeding cleanup levels encapsulated on site.
Advantages:	None	+Higher level of ecological protection +Eliminates potential for future releases at the site	+High level of ecological protection
Compliance with Key ARARs			
Attributes:	Does not comply	Moderate compliance with Soil Quality ARARs High compliance with Solids Disposal ARARs High compliance with FP S&G ARARs	Moderate compliance with Soil Quality ARARs Moderate to high compliance with Solids Disposal ARARs High compliance with FP S&G ARARs
Advantages:	None	+Eliminates potential for future non-compliances from waste material	+Repository option 1 (ridge location) would better comply with FP S&Gs +Cover option 1 (engineered cover) meets substantive Solids Disposal ARARs
Long-term Effectiveness and Permanence			
Attributes:	No action	Waste source removed from site. Bat gate may be subject to vandalism.	Waste source encapsulated on site. Effectiveness dependent on cover selection. Bat gate may be subject to vandalism.
Advantages:	None	+Most effective and permanent long term	+Effective and provides long-term permanence

**Table 15. Comparative Analysis of Removal Action Alternatives
Rainy Mine EE/CA**

Assessment Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal	Alternative 3 Excavation and On-site Disposal
Reduction of Toxicity, Mobility and Volume			
Attributes:	No action	No reduction in toxicity or mobility, but waste is removed from site.	No reduction in toxicity or mobility, but waste is encapsulated.
Advantages:	None	+Complete reduction of waste volume +Most likely for reduction of mobility	+Significant reduction of waste volume +Reduction in mobility dependent on cover option selected; option 1 will be more effective at minimizing mobility.
Short-Term Effectiveness			
Attributes:	No action	Waste removed from the site within one field season.	Waste encapsulated on site within one field season. Short-term effectiveness will depend on cover selected; option 1 will be more effective in the short term.
Advantages:	None	+Most easily constructed +Minimal risk to community and workers	+Easily constructed +Minimal risk to community and workers +Does not require off-site transport of waste
Implementability			
Attributes:	Not applicable	Waste removal, transport, and site reclamation accomplished using standard construction equipment and methods.	Waste removal, transport, site reclamation, and repository construction accomplished using standard construction equipment and methods.
Advantages:	None	+Easiest to implement; technically and administratively feasible.	+Easily implemented; technically and administratively feasible.
State and Federal Agency, and Community Acceptance			
Attributes:	Not acceptable	Waste removed from site and physical hazards mitigated.	Waste encapsulated on site and physical hazards mitigated.
Advantages:	None	+Most acceptable	+Acceptable

**Table 15. Comparative Analysis of Removal Action Alternatives
Rainy Mine EE/CA**

Assessment Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal	Alternative 3 Excavation and On-site Disposal
Estimated Total Present Worth Cost			
Attributes:	\$0	\$623,594	Repository Location 1 - Ridge ^a = \$508,150 Repository Location 2 - Mill Site ^a = \$727,931
Advantages (= cost savings over most expensive option):	+\$727,931	+\$104,337 savings	Using Repository Location 1 (Ridge) ^a = +\$219,781 Using Repository Location 2 (Mill Site) ^a = +\$0

Notes:

^aCosts based on engineered cover option; an earthen clay cover would increase costs \$25,000 to \$31,000 based on options selected.

ARAR = Applicable or Relevant and Appropriate Requirement

FP S&Gs = Forest Plan Standard and Guidelines